

ACCESSION #: 9609120082

LICENSEE EVENT REPORT (LER)

FACILITY NAME: Palo Verde Unit 1 PAGE: 1 OF 5

DOCKET NUMBER: 05000528

TITLE:

EVENT DATE: 08/10/96 LER #: 96-004-00 REPORT DATE: 09/04/96

OTHER FACILITIES INVOLVED: Palo Verde Unit 3 DOCKET NO: 05000530

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:

50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:

NAME: Daniel G. Marks, Section TELEPHONE: (602) 393-6492

Leader, Nuclear Regulatory

Affairs

COMPONENT FAILURE DESCRIPTION:

CAUSE: SYSTEM: COMPONENT: MANUFACTURER:

REPORTABLE NPRDS:

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

At approximately 1549 MST on August 10, 1996, Palo Verde Units 1 and 3 were operating at approximately 100 percent power, when both reactors tripped on low departure from nucleate boiling ratio (DNBR) following a major grid perturbation. The grid perturbation was characterized by an initial substantial load decrease followed by a significant load demand increase. The reactor trip was generated due to power exceeding the variable over power trip (VOPT) setpoint within the core protection calculators (CPC). Power exceeded the VOPT setpoint when steam bypass control system (SBCS)

valves (SBCV) opened in response to turbine load fluctuations induced by the grid perturbation. By approximately 1645 MST, both plants were stabilized in Mode 3 (HOT STANDBY) and the Unit 1 and Unit 3 shift supervisors classified the events as uncomplicated reactor trips. There were no ESF actuations and none were required. Required plant equipment and safety systems responded to the event as designed in each unit.

The grid disturbance originated in the Pacific Northwest when soaring temperatures wilted power lines, some of which sagged into trees and "flashed-over" or short-circuited. The grid disturbance resulted in a massive Western power outage. As stated above, because the initiating event was a major grid perturbation and not a full load rejection, the generator output current decrease was only momentary. The opening of the SBCVs resulted in a reactor power transient and subsequent reactor trip.

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1. REPORTING REQUIREMENT:

This LER 528/96-004-00 is being written to report an event that resulted in the automatic actuation of the Reactor Protection System (RPS) (JC) as specified in 10 CFR 50.73(a)(2)(iv).

Specifically, at approximately 1549 MST on August 10, 1996, Palo Verde Units 1 and 3 reactors (AC) tripped on low departure from nucleate boiling ratio (DNBR) following a major grid perturbation.

The reactor trip was generated due to power exceeding the variable over power trip (VOPT) setpoint within the core protection calculators (CPC) (JC). Power exceeded the VOPT setpoint when steam bypass control system (SBCS) (JI) valves (SBCV) opened in response to turbine (TA) load fluctuations induced by the grid perturbation.

2. EVENT DESCRIPTION:

Prior to the reactor trip, at approximately 1548 MST on August 10, 1996, a major grid disturbance originating in the Pacific Northwest

was in progress. Palo Verde Units 1, 2, and 3 experienced numerous electrical alarms. The grid perturbation was characterized by an initial site load decrease of approximately 700 megawatts followed by a sizable load demand increase.

The load decrease was accompanied by a main turbine first stage pressure decrease (turbine control valves throttled closed). The SBCS responded as designed by quick opening the X group SBCVs. The remaining SBCVs responded by modulating to control pressure as expected. The opening of the multiple SBCVs and the sudden increased load demand resulted in an excess steam demand scenario which reduced the reactor coolant system (RCS) (AB) cold leg temperature which in turn inserted positive reactivity [due to the negative moderator temperature coefficient (MTC) in the units].

With the sudden load demand increase, the SBCVs began to close. At this time, approximately 1549 MST, the Unit 1 and Unit 3 reactors tripped on low DNBR, as expected, when the CPCs generated auxiliary trips on the rate of change of power (VOPT). The CPC VOPT is an expected response to the load rejection, opening of SBCVs, excess steam demand, and resulting power increase due to decreasing temperature with a negative MTC. The control element assemblies (AA) inserted as designed.

Although the load rejection and SBCS response was very similar in all three Palo Verde units, neither the reactor or turbine tripped

in Unit 2. The reactor power in Unit 2 momentarily spiked to approximately 102 percent without reaching the VOPT setpoint, then dropped to approximately 96 percent. However, the MTC was more negative in Units 1 and 3 (i.e., -34 and -23.5 pcm per degree Fahrenheit respectively) than

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in Unit 2 (-9.5 pcm per degree Fahrenheit). Unit 2 had a beginning of core (BOC) MTC as opposed to an end of core (EOC) MTC in both Units and 3. The unit responses to the event is consistent with core life conditions. The closer the unit is to EOC, the more rapid the power increase and the higher probability of reaching the VOPT setpoint.

By approximately 1645 MST, both plants were stabilized in Mode 3 (HOT STANDBY) and the Unit 1 and Unit 3 shift supervisors classified the events as uncomplicated reactor trips. There were no engineering safety feature actuations and none were required.

Required plant equipment and safety systems responded to the event as designed in each unit.

3. ASSESSMENT OF THE SAFETY CONSEQUENCES AND IMPLICATIONS OF THIS

EVENT:

A safety limit evaluation was performed as part of the APS Incident Investigation. The evaluation determined that the plant responded

as designed, that no safety limits were exceeded, and that the event was bounded by current safety analyses.

The reactor trip experienced by Units 1 and 3 did not result in a transient more severe than those already analyzed in the Updated Final Safety Analysis Report (FSAR) Chapter 15 or Chapter 6. The event is bounded by the scenario in Chapter 15.1.3 (Increased Main Steam Flow). The excess steam demand events are protected against DNBR specified acceptable fuel design limit (SAFDL) violation by a conservative CPC DNBR calculation and a conservative CPC VOPT. There is no indication that the DNBR SAFDLs were violated nor would any violations be expected based on the more limiting scenarios in the Updated FSAR. The calculated CPC DNBR was well above the 1.30 limit at the time of the trip.

The primary and secondary system pressure boundary limits were not approached. The event did not result in any challenges to the fission product barriers or result in any releases of radioactive materials. Therefore, there were no safety consequences or implications as a result of this event. This event did not adversely affect the safe operation of the plant or health and safety of the public.

4. CAUSE OF THE EVENT:

An investigation of this event is being conducted in accordance with the APS Incident Investigation Program.

The grid disturbance originated in the Pacific Northwest when power lines sagged into trees due to high load conditions and high temperatures and "flashed-over" or short-circuited. The grid disturbance resulted in a Western power outage. As stated above,

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because the initiating event was a major grid perturbation and not a load rejection, the generator (TB) output current decrease was only momentary. The opening of the SBCVs resulted in a reactor power transient and subsequent reactor trip (SALP Cause Code C: External Cause).

No unusual characteristics of the work location (e.g., noise, heat, poor lighting) directly contributed to this event. There were no procedural errors or personnel errors which contributed to this event.

5. STRUCTURES, SYSTEMS, OR COMPONENTS INFORMATION:

There are no indications that any structures, systems, or components were inoperable at the start of the event which contributed to this event. No failures of components with multiple functions were involved. No failures that rendered a train of a safety system inoperable were involved.

6. CORRECTIVE ACTIONS TO PREVENT RECURRENCE:

An independent investigation of this event is being conducted in accordance with the APS Corrective Action Program. As previously

discussed, the CPC VOPT is an expected response to the load rejection, opening of SBCV's, excess steam demand, and resulting power increase due to decreasing temperature with a negative MTC.

The unit responses to the event are consistent with core life conditions. The closer the unit is to EOC, the more rapid the power increase and the higher probability of reaching the VOPT setpoint.

As part of the investigation, actions to prevent recurrence are being evaluated and will be tracked to completion under the APS Commitment Action Tracking System (CATS).

APS is forming a task force to evaluate APS and western grid issues.

7. PREVIOUS SIMILAR EVENTS:

Previous events have been reported pursuant to 10CFR50.73 where a grid perturbation resulted in simultaneous reactor trips. As reported previously in LER 1-91-010-00, on October 27, 1991, simultaneous reactor trips occurred in both Palo Verde Units 1 and 3 when a grid perturbation resulting from a lightning strike on a substation feeder line. Based on the information available at this time, the cause and specific scenario of the event reported by this LER do not appear to be related to the previous event. Therefore, the corrective actions for the previous events would not have prevented this event.

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8. ADDITIONAL INFORMATION:

Based on reviews by the Plant Review Board, the Management Response Team and the Incident Investigation Team, unit restarts were authorized by the Director of Operations in accordance with approved procedures. On August 11, 1996, Unit 3 entered Mode 2 (STARTUP) at approximately 1118 MST, Mode 1 at approximately 1452 MST, and synchronized to the grid at approximately 1756 MST. On August 11, 1996, Unit 1 entered Mode 2 at approximately 2054 MST. On August 12, 1996, Unit I entered Mode 1 at approximately 0018 MST and synchronized to the grid at approximately 0454 MST.

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APS

Commitment, Innovation, Energy.

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192-00979-JML/BAG/KR

September 4, 1996

U. S. Nuclear Regulatory Commission

ATTN: Document Control Desk

Mail Station P1-37

Washington, D.C. 20555

Dear Sirs:

Subject: Palo Verde Nuclear Generating Station (PVNGS)

Unit 1 and Unit 3

Docket Nos. STN 50-528 and 50-530

License Nos. NPF-41 and NPF-74

Licensee Event Report 96-004-00

Attached please find Licensee Event Report (LER) 96-004-00 prepared and submitted pursuant to 10CFR50.73. This LER reports August 10, 1996 reactor trips in Units 1 and 3 following a major grid perturbation. In accordance with 10CFR50.73(d), a copy of this LER is being forwarded to the Regional Administrator, NRC Region IV. If you have any questions, please contact Daniel G. Marks, Section Leader, Nuclear Regulatory Affairs, at (602) 393-6492.

Sincerely,

JML/DGM/KR/pv

Attachment

cc: L. J. Callan (all with attachment)

K. E. Perkins

K. E. Johnston

INPO Records Center

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